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NOTES ON ALASKAN COLLEMBOLA
II. THREE NEW SPECIES OF ARCTIC COLLEMBOLA[1]

BY KENNETH A. CHRISTIANSEN
American University, Beirut

This is the second in a series of papers on the Collembola fauna of northern Alaska. The material on which this paper is based was collected by Dr. Neal A. Weber while holding a contract with the Office of Naval Research and while stationed in the Alaskan Arctic under the support of the Arctic Research Laboratory.

I wish to thank Dr. Marie Hammer and Dr. Harlow B. Mills for their helpful suggestions concerning this work.

Schaefferia variabilis, n. sp.
(Pl. 10, figs. 1-11; Pl. 11 figs. 2, 6, 7)

Holotype. Eyes two on either side, pigmented and situated on a lightly pigmented eyespot. No other pigment present. Integument granulate with granulations uniform and moderate in size. Clothing of long, sturdy, straight to slightly curved, and mostly sparsely "ciliate" setae, with scattered smaller curved or straight naked setae. The longer setae on the last three abdominal segments are somewhat longer than those on the remainder of the body.

Antennal segments one through three subequal in width, fourth antennal segment slightly narrower than the third at its base and tapering gently to a blunt point. Antennal segments one through three subequal in length, with the fourth being about one and one-half times as long as the third. Fourth antennal segment with a simple distinct apical, retractile bulb, protected on the ventro-external side by an erect papilla. Dorsally there are many long, mostly straight smooth setae, and five thick blunt, curved "olfactory" setae. Ventrally there are present also a number

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[1] Published with a grant from the Museum of Comparative Zoology at Harvard College.

of straight smooth setae, two blunt "olfactory" setae and six small straight truncate to slightly clavate setae, (see Plate 11, fig. 2) which are less than half as long as the normal pointed setae. Third antennal segment with three transverse rows of smooth pointed setae. Third antennal segment with two short roughly boot-shaped pegs, situated in deep integumentary folds, protected on either side by a blunt seta, similar to those on the fourth antennal segment. Antennal segments one and two each with a single irregular transverse row of smooth pointed setae.

Mandibles with well-developed molar plate and four to five blunt apical teeth. Maxillae with four heavy teeth and a number of thin lamellae of varying sizes, the largest two being deeply serrate on their inner edges. Post-antennal organ (P.A.O.) located in a shallow triangular depression and consisting of three or four lobes situated around a roughly hemispherical central boss. The two anterior lobes are in transverse line and the one or two posterior lobes diagonal to this. Small accessory boss present just below and behind the P.A.O. Head clothing as in figure.

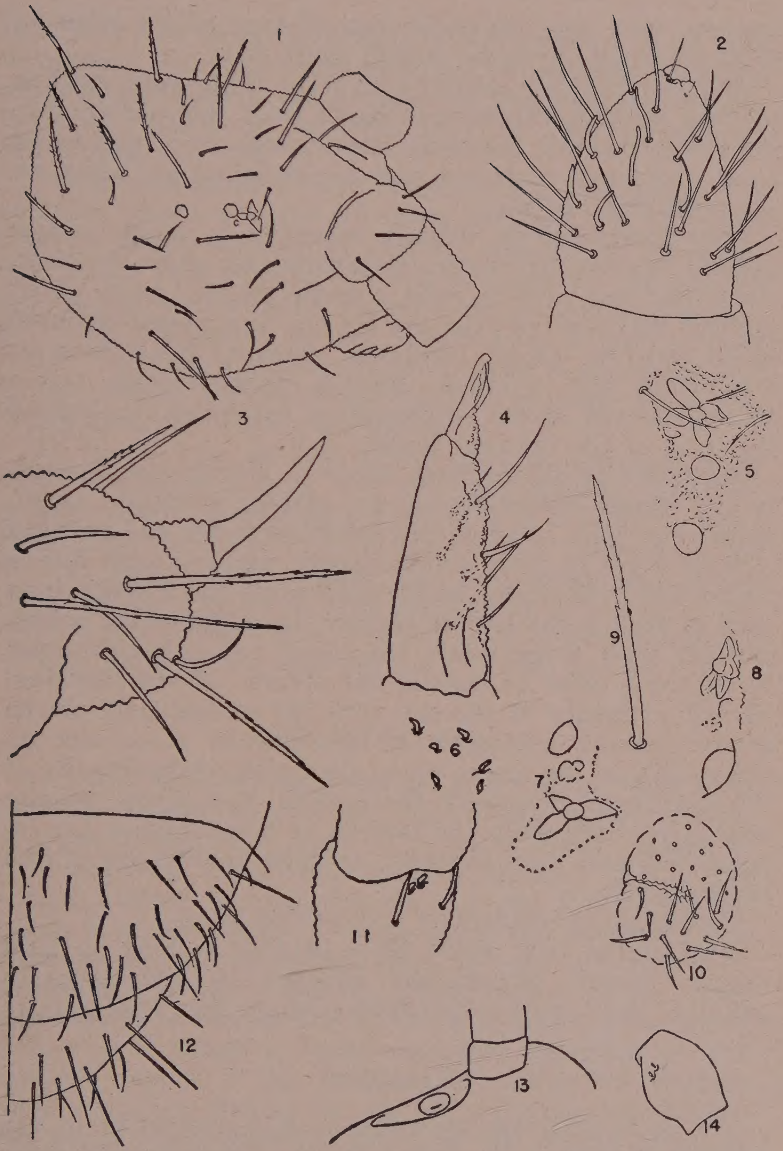
First thoracic segment somewhat reduced, possessing only a single transverse row of four setae. The outer two setae are long and ciliate; the dorsal pair are short, smooth, curved, and very thick. Second thoracic segment with three irregular transverse rows of setae. The anterior row somewhat diagonal in position. Third thoracic

---

EXPLANATION OF PLATE 10

Figs. 1-11. *Schaefferia variabilis*, n. sp. 1. Head, lateral view (holotype). 2. Left fourth antennal segment, dorsal view (holotype). 3. Left anal horn and adjacent abdominal area, lateral view (paratype). 4. Left dens and mucro, from right side (paratype). 5. Left eyes and P.A.O., from above (paratype). 6. Sensory pegs of third antennal segments, showing variation in form. 7. P.A.O. and anterior eye, showing abnormal double accessory boss (paratype). 8. P.A.O. and anterior eye, seen from side of organ (paratype). 9. Single large thoracic seta. 10. Genital plate, male (one-half of setae shown) (paratype). 11. Third antennal segment, sensory organ.

Figs. 12-14. *Pseudanurophorus arctica*, n. sp. 12. Right half of fifth and sixth abdominal segments, dorsal view (holotype). 13. Left P.A.O. and antenna base, dorsal view (paratype). 14. Third antennal segment (setae omitted), showing apical sensory organ, dorsal view (paratype).



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segment with one transverse row of long ciliate setae, in front of which are three smooth short setae.

Abdomen sparsely clothed with setae of all types, tending to form irregular transverse bands over the median portions of abdominal segments one through four, and being more uniformly scattered and somewhat more dense on segments five and six.

Legs comparatively densely setaceous, a single longer pointed seta usually present externally just above the claw. Claw long and narrow, with a single internal tooth about midway between the base and the tip, and a smaller, more basad pair of lateral teeth; no external teeth present. Unguiculus with a broad, internal, basal lamella, and a sharp, pointed apical prolongation extending to beyond the level of the internal tooth.

Furcula with all segments distinct. Manubrium ventrally and dentes internally not as coarsely granulate as remainder of body. Manubrium naked ventrally, and sparsely clothed dorsally with short smooth setae, except for a medio-distal triangular unsetaceous area, and a single long seta at each basal lateral corner. Dens ventrally naked, dorsally with seven setae, the basal and subapical ones being about twice as long as the others. Mucro tapering, slightly expanded at the tip, with the central part of the mucro dorsally granulate. A thin lamella is present on either side of the mucro along the apical three-fourths of the structure. Internally the lamella is a flatly arcuate structure. Externally the lamella is much higher for its basal half and then abruptly narrows to the size of the inner lamella.

Tenaculum quadridentate and lacking setae.

Anal spines two, about three-fourths as long as hind unguis, slightly curved and situated on high separate papillae. Anal spines plus papillae longer than hind unguis.

VARIATION

The most striking variation in this species is in the number of lobes in the P.A.O. being quite commonly three on one side and four on the other, as in the holotype. Other specimens have an equal number (three or four) on either side, with four being the most common number. In no case were more than four lobes observed on one side. Another common variation is the presence of two accessory bosses. In other specimens the boss may be very indistinctly demarcated.

The setae of all parts vary considerably, in all ways. The antennal olfactory hairs are fairly constant, but the short truncate hairs vary from slightly truncate to distinctly clavate and from five to eighteen in number. The sensory rods of the third antennal segment are always bent, but, as shown in the figure, do not always have a marked boot shape. The head and body clothing varies considerably, but the long ciliate setae are fairly constant, although the degree of ciliation and the size vary greatly.

The mucro also exhibits a good deal of variation, with some specimens having the external lamella expanded greatly basally, producing the effect of a distinct lamellar tooth. The anal horns vary in size, but in all cases observed were at least slightly smaller than the ventral edge of the third unguis. The horns plus the papillae are usually subequal to the ventral edge of the claw, but in some specimens were as much as one and one-fourth times as long.

RELATIONSHIPS

Although, as Stach suggests, the genus *Schaefferia* is, as presently constituted, probably polyphyletic in its make-up, the present species appears to be quite closely related to the *Schaefferia emucronata* group (Absolon, 1900). The reduced number of eyes, the shape of the P.A.O. and accessory boss, the sparsely ciliate setae, the shape and size of the unguis, as well as the facies, all suggest a very close relationship. While a definite determination of the exact relationships among all the members of the *S. emucronata* complex will await a fairly complete collection of the Holarctic region, I feel justified in calling the present specimens a new species for the following reasons: a) the presence of short truncate hairs on the fourth antennal segment, not mentioned in any form of *S. emucronata* or *S. pouadensis* Delamare-Deboutteville, (1945); b) the much greater development of the furcula; c) different construction of the third antennal sense organ; d) different pattern of the genital plate of the male (see figure); and e) the unusual shape of the third antennal sensory pegs.

MEASUREMENTS

All segmental measurements and ratios taken of imbricate areas along the middorsal line, and are exclusive of intersegmental membranes. All measurements in millimeters. Holotype: total length, excluding antennae, 1.35; cephalic diagonal, .26; thoracic segment one, .07; thoracic segment two, .14; thoracic segment three, .15; abdominal segment one, .14; abdominal segment two, .15; abdominal segment three, .14; abdominal segment four, .15; abdominal segment five, .09; abdominal segment six, .08.

Segmental ratios for size range .60 - .66 mm.:

(thoracic segment 2=10)

	total antenna	cephalic diagonal	thoracic segment 2	thoracic segment 3
mean ratio	23	26	10	8.9
average deviation	1.0	1.0	X	.3

	abdominal segment 1	2	3	4	5	6	hind unguis
mean ratio	6.6	6.9	7.2	9.5	7.1	2.9	.50
average deviation	.5	.3	.4	.3	.9	.3	.04

(antennal segment 3=10)

	antennal segments 1	2	3	4
mean ratio	6	11	10	18
average deviation	.9	.7	X	1.0

(fore unguis=10)

	fore unguis	fore unguiculus	hind unguis	hind unguiculus
mean ratio	10	4.4	11	5.4
average deviation	X	.5	.4	.5

Type locality: Umiat, Colville River, Alaska, July 4, 1949, Neal A. Weber, collector. The holotype and fifty paratypes are being deposited in the United States National Museum, Washington, D. C., and thirty-five paratypes are being deposited in the Museum of Comparative Zoology, Cambridge, Massachusetts.

Pseudanurophorus arctica, n. sp.

(Pl. 10, figs. 12-14; Pl. 11, figs. 1, 3-5)

Holotype. Body stout, cylindrical, rounded posteriorly, head about as wide as body. Without eyes or pigment. Clothing of scattered short, straight to weakly curved setae with a few longer straight setae, especially on the posterior regions of the body. Common setae of the head are from nine to twelve micra in length and more or less curved. There is also a single row of fifteen micra long setae along the posterior margin of the head.

First thoracic segment is naked dorsally and has a single pair of setae at each leg base, with the superior seta of each pair longer than the inferior. On each leg base of the second and third pair there is a set of four long setae. The remainder of the thorax and the abdomen is clothed mostly with short, curved to straight setae, one-half to three-fourths as long as long setae, with the smaller sizes being much more numerous. Besides these there are a few long setae, arranged as follows: second and third thoracic segment with a single seta at each lateral edge of the setaceous area; first and second abdominal segments each with a single medio-lateral pair of setae, with those on the second segment being slightly longer; third and fourth abdominal segments with four setae each, situated in lateral pairs, the anterior of each pair being slightly longer; fifth abdominal segment with a posterior row of four setae which are longer than any anterior body setae, and a single anterio-lateral shorter seta on either side; sixth abdominal segment with eight long setae.

Integument finely and uniformly granulate. Unsetaceous intersegmental membranes large between all segments except the fifth and sixth.

Fourth antennal segment fusiform, third somewhat spheroidal in appearance, and the second and first segments sub-cylindrical in shape. Fourth antennal segment with numerous obtusely pointed "olfactory" hairs, slightly thicker than, and subequal in length to, the normal clothing setae. Sense organ of third antennal segment consists of two blunt rods situated in shallow integumentary folds, the inner being somewhat above the outer.

Mandible with well-developed basal molar plate, well separated from the four or five apical teeth. Mandible externally with a darkened swelling opposite the apical end of the molar plate. Maxilla with two heavy teeth and three thin lamellate plates, serrate on their inner edges. The outer two plates are apparently double at their inner border, and the more dorsal of these plates extends well beyond the rest of the maxilla and ends in two very large serrations.

P.A.O. situated in a shallow depression on the side of the head near the base of the antenna. It is an oval, swollen lobe, about two-thirds as wide as long, and with long axis roughly perpendicular to the long axis of body.

Dorsum of first thoracic segment greatly reduced, lacking setae. Legs without tenent hairs, unguis simple, acuminate, without teeth. Unguiculus pointed, less than half as long as unguis, sides parallel for basal third of its length, then converging directly for apical two-thirds, with the inner side being the more strongly deflected.

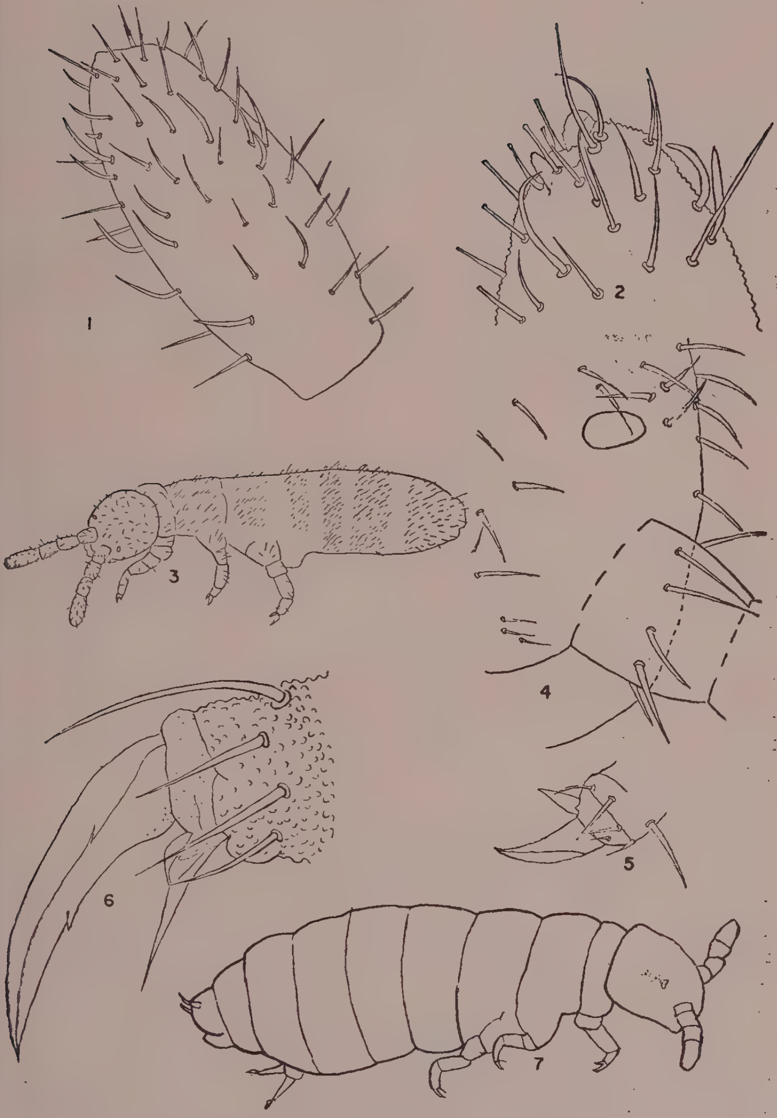
Abdominal segments five and six distinctly separated, but with a narrow intersegmental membrane. Furcula and tenaculum lacking. End of abdomen rounded, lacking anal spines or papillae. Anus ventrally directed.

VARIATION

The sensory setae of the fourth antennal segment differ only slightly from the normal clothing setae, and vary considerably in number and position. There may be as few as eight or as many as thirteen, with ten the usual number; of these a few are ventral in position (from none to three), the remainder dorsal.

EXPLANATION OF PLATE 11

Fig. 1. *Pseudanurophorus arctica,* n. sp., dorsum of right fourth antennal segment (paratype). Fig. 2. *Schaefferia variabilis,* n. sp., apex of ventral surface of fourth antennal segment (paratype). Figs. 3-5. *Pseudanurophorus arctica,* n. sp. 3. Habitus (paratype). 4. Left antennal base and P.A.O., dorsal view (paratype). 5. Right hind foot (paratype). Figs. 6-7. *Schaefferia variabilis,* n. sp. 6. Right hind foot (paratype). 7. Habitus (setae omitted) (paratype).



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The small setae covering the thorax and abdomen are not arranged in any readily visible pattern. There is a very rough arrangement into transverse rows, but this is neither constant nor very clear. The common situation is for these rows to be as follows: thoracic segment one, none; thoracic segment two, 6; thoracic segment three, 5 or 6; abdominal segment one, 4; abdominal segment two, 4; abdominal segment three, 4; abdominal segment four, 5; abdominal segment five, 5; abdominal segment six, 2. The first row of the fifth segment is usually preceded by a single discreet seta on either side. The length of the longer setae varies considerably, but those on the fifth and sixth segments are usually longer than those on the other segments.

RELATIONSHIPS

This species is the first of the genus to be described from North America. While fitting into the generic limits as already set up, it is readily distinguishable from all previously described species. Of these it would appear to be most closely related to *P. binoculatus* Kseneman (1934), and to *P. alticola* Bagnall (1949). It can be distinguished from the former by the lack of eyes and sensory hairs on the fifth abdominal segment, as well as by the swollen nature of the P.A.O. It can be separated from the latter by the shorter, broader P.A.O. and the possession of long setae on the fifth and sixth abdominal segments.

MEASUREMENTS

All segmental measurements and ratios are of the setaceous area along the middorsal line, excluding the intersegmental membranes. All measurements in millimeters. Holotype: total length, excluding antennae, .64; cephalic diagonal, .12; thoracic segment two, .05; thoracic segment three, .05; abdominal segment one, .04; abdominal segment two, .04; abdominal segment three, .04; abdominal segment four, .05; abdominal segment five, .04; abdominal segment six, .01; antennal segment one, .01; antennal segment two, .03; antennal segment three, .03; antennal segment four, .04; fore unguis, .014; fore unguiculus, .007; hind unguis, .015; hind unguiculus, .008.

Segmental ratios:

(abdominal segment 4=10)

	total antenna	cephalic diagonal	thoracic segment 1	2	3
mean ratio	13.4	18.1	4.4	8.8	10.7
average deviation	.8	1.3	.4	.6	.7

	abdominal segment 1	2	3	4	5	6	furcula	third unguis
mean ratio	9.7	9.5	8.8	10	5.9	5.3	11.6	3.5
average deviation	.4	.5	.3	X	.3	.5	.8	.3

(antennal segment 4=10)

	antennal segments 1	2	3	4
mean ratio	6.3	6.8	6.7	10
average deviation	.9	.8	.7	X

(mucro=10)

	manubrium	dens	mucro
mean ratio	32	25	10
average deviation	4	3	X

(unguis=10)

	unguis	unguiculus
mean ratio	10	4.3
average deviation	X	.2

Type locality: Point Barrow, Alaska, June 1949, Neal A. Weber, collector. The holotype and forty paratypes are being deposited in the United States National Museum, Washington, D. C. A series of twenty paratypes is being deposited in the Museum of Comparative Zoology, Cambridge, Massachusetts.

Anurida hammeri, n. sp.

(Pl. 12, figs. 1-13)

Holotype. Color white, pigment completely lacking. Clothing of scattered straight stout setae of varying lengths. Body about four and one-half times as long as wide, deeply constricted intersegmentally, so as to give a lobed appearance. Abdominal segments almost cylindrical, only slightly compressed dorso-ventrally. Fourth antennal segment with a large apical, distinctly trilobed, retractile bulb, situated in a shallow pit, and nine large, blunt "olfactory" hairs. These hairs are arranged in two groups: one group of six hairs along the dorso-external side, and a second group of three along the dorso-internal area.

Third antennal segment almost completely fused with fourth. Sense organ of third segment consists of two small cylindrical pegs situated side by side in a shallow integumentary fold. Integument granulate, with the granules being large and fairly uniform in size. Antennal segments one through three decreasing in diameter, one being the widest. Segments three and four subequal in diameter. Head viewed from above somewhat heart-shaped. Buccal cone short and blunt. P.A.O. consisting of thirteen papillae packed closely into a circle. Individual papillae as seen from the side are erect triangles with rounded angles; these are packed together to form a low truncate cone. Eyes five in number on each side, pigmentless, arranged as follows: two close together, located just posterior to the P.A.O., the anterior of these somewhat larger than the posterior, and somewhat oval in shape; two others located considerably behind the forward pair and further apart; the fifth is positioned about midway between these pairs, and somewhat dorsad of both. Fourth antennal segment with numerous moderately long, slightly curved, slender setae. One single straight seta on apex on truncate papilla. Third segment with scattered similar setae, plus

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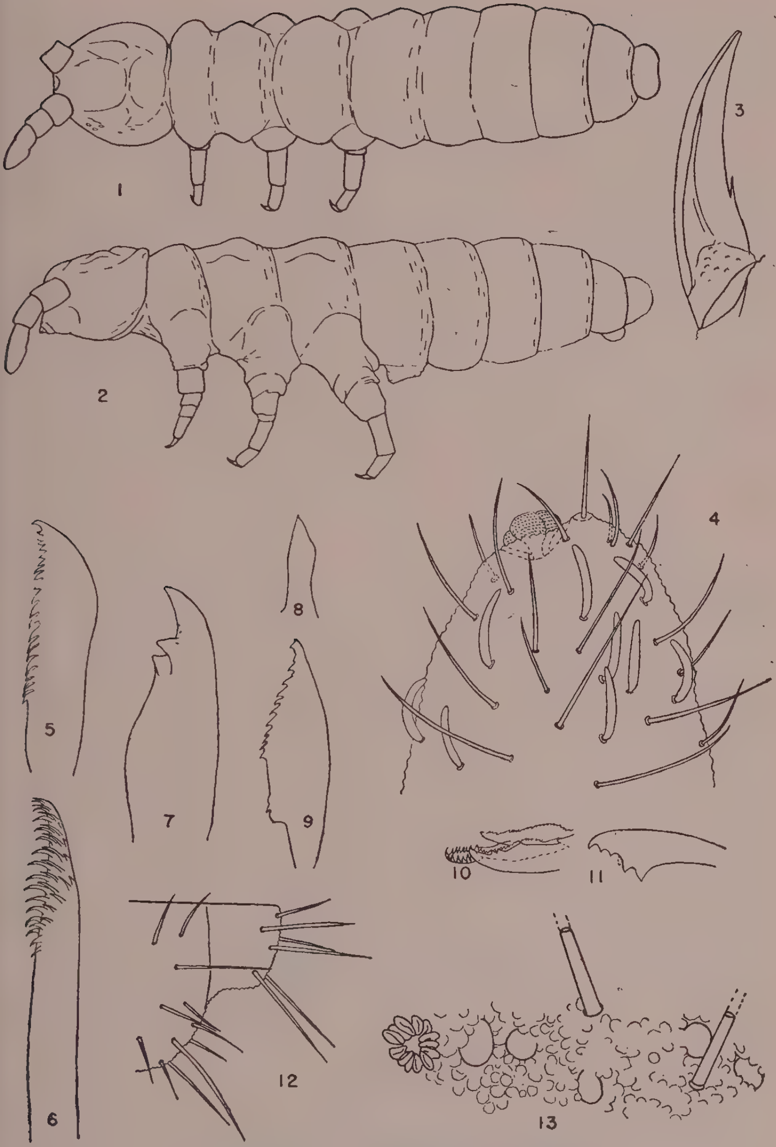
EXPLANATION OF PLATE 12

Figs. 1-13. *Anurida hammeri,* n. sp. 1. Habitus, dorsal view (setae omitted). 2. Habitus, lateral view (setae omitted). 3. Left hind claw (paratype). 4. Right fourth antennal segment, dorsal view (paratype). 5. First lamella of maxilla (paratype). 6. Second lamella of maxilla (paratype). 7. Galea of maxilla (paratype). 8. Basal process of maxilla (paratype). 9. Third lamella of maxilla (paratype). 10. Maxilla, showing all parts in natural position (paratype). 11. Mandible (paratype). 12. Left half of last two abdominal segments, with setae (paratype). 13. Eyes and P.A.O. of right side (paratype).



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a single transverse median row of straight longer setae. First and second segments each with a single median transverse row of long straight setae, slightly thicker and larger than those on the third segment.

Clothing of head straight, sturdy setae of three sizes: the smallest size is subequal to the clothing setae of the fourth antennal segment, but much stouter and more spiniform. These are scattered sparsely and irregularly over anterio-dorsal area between antennal bases and over posterior half of the head. Slightly longer setae are scattered irregularly and sparsely over the dorsal and lateral surfaces of the head. The longest setae are approximately four times as long as the shortest and are arranged as follows: a band of seven setae on each side covering the cheek areas of the head; three other setae, two in a straight line between the middle of the antenna base and the rear of the head, and the third about midway between these two and displaced laterally.

Body with sparsely scattered setae of varying lengths which tend to form interrupted tranverse bands. Fifth abdominal segment with four setae definitely longer than any anterior body setae arranged along the posterior edge. Sixth segment with eight similar setae, with four somewhat shorter setae located between them.

Furcula, anal horns, unguiculus, and tenent hairs lacking. Claw large, with a single large protruding basal tooth.

Mandibles without molar area equipped with five large teeth, the basal two being larger. Maxillae with galea possessing three teeth and an expanded basal area. Lamella one and three pointed arcuate, with serrate single edges. Lamella two projecting beyond the rest of the maxilla and possessing a multiple pectinate edge for the projecting part.

Male genital plate circular, slightly raised, with twenty short, fairly uniform smooth setae, arranged as follows: eight forming a circlet about the genital aperture, and the remaining twelve filling a roughly lunate area anterior to this group.

VARIATION

The most striking variation is in the grouping and number of the eyes. The anterior two are often closely approximated or even fused, and in many cases only four eyes are present. The number of papillae in the P.A.O. also varies, from twelve to seventeen. The chaetotaxy of the head and abdomen varies considerably, both in number of setae and in the positions. The size of the setae increases with the size of the specimen. The number and position of the olfactory hairs of the fourth antennal segment vary somewhat (eight to ten), but only in occasional specimens. In a few cases the apical truncate conical area lacks a straight seta. The mouth parts are fairly uniform, the apical two teeth of third maxillary lamella may be elongate, and the large teeth on the mandible may be either two or three.

RELATIONSHIPS

This species, in the structure of the P.A.O. and in mouthparts, especially in the form of the second pectinate maxillary lamella, is close to the *A. granaria* (Nicolet, 1847) group. The presence of four or five eyes removes it from all known species of this group. As the eyes in the new species are all without pigment and show other signs of reduction, this species may well represent a transition between the *granaria* group and those species of *Anurida* which are fully equipped with eyes and pigment. The present species appears to be most closely related to the species *granaria* Nicolet and *pseudogranaria* Stach (1949), but can be readily separated from both by the larger number of olfactory hairs on the fourth antennal segment (nine in the present species, as compared with six in *granaria*), by the long setae on the fifth and sixth abdominal segments, and by the similar serrations on the first and third maxillary lamellae.

MEASUREMENTS

Due to the great flexibility of the integument and the lack of clearly marked imbricate or setaceous areas, attempts to derive satisfactory ratios were fruitless. Thus the only measurements given are the absolute segmental and other measurements as determined on the holotype. All measurements in millimeters. Cephalic diagonal, .46; thoracic segment one, .16; thoracic segment two, .32; thoracic segment three, .32; abdominal segment one, .24; abdominal segment two, .29; abdominal segment three, .27; abdominal segment four, .30; abdominal segment five, .19; abdominal segment six, .10; antennal segment one, .09; antennal segment two, .09; antennal segments three and four, .21; unguis of third leg along ventral edge, .08.

Type locality: Point Barrow, Alaska, June and July, 1949, Neal A. Weber, collector. The holotype and seven paratypes are being deposited in the United States National Museum, Washington, D. C. Four paratypes are being deposited in the Museum of Comparative Zoology, Cambridge, Massachusetts.

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PSILOBETHYLUS IN THE NEW WORLD (HYMENOPTERA: BETHYLIDAE)

By W. L. Brown, Jr. and F. Y. Cheng
Biological Laboratories, Harvard University

The family Bethylidae is one of the most unsatisfactorily known of the larger hymenopterous assemblages. Present-day taxonomy is dependent upon the monograph of Kieffer in Das Tierreich (Lief. 41, 1914) and on such meager authentically determined material as exists in the larger collections of insects. Kieffer's work rests on a very poor basic literature, and furthermore, the monograph includes many elements like the dryinids, *Algoella, Embolemus,* etc. which cannot now be considered close to the bethylids. The subsequent removal of many of these tramontane groups does little to relieve the difficulty one meets in trying to use Kieffer's work for practical identification. These considerations, together with the scarcity of material for study, make taxonomic endeavor in the bethylids a frustrating experience.

Interest in a female bethylid received from Dr. F. Bonet of Mexico City led to attempts at identification by means of Kieffer's key (*op. cit.*), where we ran it down in the wingless division to couplet 26, p.233. The choice here given was: "Mesonotum und scutellum deutlich" or "Mesonotum oder scutellum fehlend." Our specimen had the mesonotum and scutellum apparently weakly separated, and we decided in favor of a doubtful identification "cf. *Psilobethylus*." From Kieffer's generic characterization (p. 274) the specimen differed in having four (*vs.* three) mandibular teeth, but otherwise, agreement was fair. Sent to Mr. C. F. W. Muesebeck, the female was identified as *Psilobethylus* and was returned promptly with nine very similar females from various parts of the United States.

Psilobethylus has hitherto been represented by three species from the Old World. Only one species, *Ps. luteus* Kieffer (genotype) from Europe, has been known from the female sex. The descriptions of *luteus* leave much to be desired, and it is only with some doubt that the New World species are considered congeneric with the genotype. In view of the confusion presently holding among the bethylid genera, there seems little excuse for separating the American forms at this time. For better characterization, the males of the New World forms need to be discovered and the Old World ones to be redescribed.

The females of the New World forms are slender, yellowish or ferrugineous wingless wasps of very small size. The head is oblong and more or less depressed. The eyes are small and placed near the anterior quarters or fifths of the sides of the head. The antennae are 13-segmented, incrassate, the scapes especially so, and are inserted in pits close together on the extreme anterior part of the head. The clypeus and adjoining structures are much reduced and modified by fusion, so that the two depressions ventral to the processes upon which the antennae are inserted have become separated by a small but sharp vertical plate. The legs are of normal bethylid type, without peg-like spines.

The fusion of the clypeus with adjoining structures, the reduction of eyes and lack of strong pigmentation, and the incrassation of the antennae are modifications for hypogaeic or other cryptobiotic existence found also in other hymenopterous groups. Among the ants, certain dorylines and cerapachyines show similar modification, and the structural similarity has been used to support contentions that these two subfamilies are close in a phylogenetic sense. It need only be pointed out that the modifications shown by other, clearly distant groups like *Discothyrea* among the ants and *Psilobethylus* among the bethylids demonstrate that the phenomenon is one of multiple convergence and that it may not be trusted in attempting to establish relationships of systematic significance.

Little is known concerning the biology of the American forms. It is assumed that our forms follow the bethylid pattern of "parasitism" on other insect larvae. The collection data and obvious structural features of our females indicate that the hosts are hypogaeic in habit, at least during the stage at which attacked. The American records for the wasps are all indicative of a habitat in the upper soil layers or at the level of the soil cover.

Among the relatively meager material at our disposal can be recognized what seem to be two distinct species, separable on the basis of size, proportion, sculpture and shape of head. The smaller and smoother of the two species, *lucidus* n. sp., is set up for specimens stemming from Illinois, West Texas, North Carolina and Tabasco in southern Mexico. In view of slight differences between individuals from these widely separated localities, it seems probable that *lucidus* contains more than one specific entity. The differences are so elusive, however, and the variation within series relatively so great that we cannot confidently assort them taxonomically without the corresponding males. It must be borne in mind that each of the locality-series probably represents the offspring of a single female. Such a situation creates constancy within series and differences between series that are often illusory in the systematic sense, since not only may the mothers show slight individual, non-taxonomic differences, but the hosts and the differing food supplies they afford may alter radically the structure of individuals from one brood to another. In fact, even the large, densely sculptured *foveolatus* may eventually prove to be nothing more than a form of *lucidus* arising through differential feeding. The differences in size, shape, and especially in sculpture are of such magnitude that we feel fairly confident in separating the two as species at the present time.

Psilobethylus foveolatus n. sp.

(Plate 13, figure 1)

Holotype female: Total (synthetic aggregate) length 2.20±.04 mm.; head length, maximum measurable, 0.53 ±.005 mm.; alitrunk length, maximum diagonal measurement in lateral view, 0.72±.01 mm.; cephalic index (maximum head width expressed as a percentage of head length) 75±1. Habitus as in figure, except that (in both figures 1 and 2) the insertions of the antennae are depicted more boldly and more strongly set off than they are in the actual specimens. Body slender, gently depressed; head evenly convex dorsally, in lateral view suboval, with subtruncate posterior end. Eyes long-oval, with 10-12 coarse facets arranged in a double row, plus a very few other less well-developed facets. Sides of head gently convex, subparallel (see figure). Mandibles largely hidden when head is viewed from dorsal side; dentition as in figure 3. Maxillary palpi not clearly visible, but apparently much as described for *lucidus*. Labial palpi not visible. Alitrunk slightly depressed dorsally, in profile the dorsal outline nearly perfectly straight. Legs gently incrassate, profemora more strongly so.

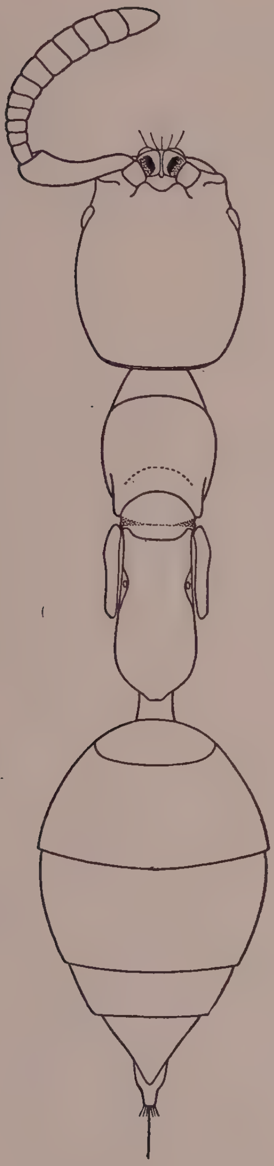
Dorsum and sides of head covered with small, densely arranged, umbilicate-piligerous foveolae, contiguous and subcontiguous on most of the sides and dorsum, but thinning out slightly in the extreme median dorsal region, where a very restricted area shows some "Scotch grain" coriaceous sculpture and is feebly shining. The greater part of the head is opaque. Alitrunk rather strongly and densely coriaceous, subopaque to opaque, with a few indistinct punctures. Mesonoto-scutellar sutural line moderately distinct. Propodeum feebly subrugulose in addition to the ground sculpture. Gaster smooth and shining. Legs, scapes and mandibles very feebly and finely punctulate-granulose, weakly to moderately shining.

Pilosity consisting of fine, tapered hairs, rather abundant and erect or suberect, but more nearly reclinate on the appendages, short to moderate in length and distributed rather evenly over the body. Color deep yellowish-ferrugineous; gaster brown, shading off to ferrugineous at both basal and apical extremities; legs and antennae clear yellow.

EXPLANATION OF PLATE 13

Fig. 1. *Psilobethylus foveolatus* new species, holotype female, Mt. Vernon, Virginia, dorsal view. Fig. 2. *Ps. lucidus* new species, paratype female, Santa Rosa, Tabasco, dorsal view of head. Fig. 3. *Ps. lucidus* new species, paratype female, Durham, North Carolina, external view of mandibular dentition.

Figures 1 and 2 are drawn to the same scale.



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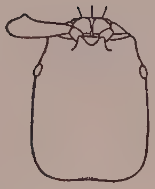

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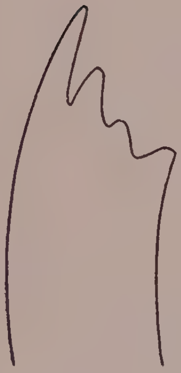


3

BROWN AND CHENG — PSILOBETHYLUS

Holotype deposited in United States National Museum; collected at Mt. Vernon, Virginia, Dec. 16, 1944, "in *Andropogon*" (J. C. Crawford).

A single paratype female, data and deposition as for holotype, is very similar to the holotype in every way except that the gaster is slightly differently expanded. The measurements and proportions, except for the total length difference due to gastric expansion, are within the errors stated for the holotype.

Psilobethylus lucidus n. sp.

(Plate 13, figures 2, 3.)

Holotype female: Similar to *Ps. foveolatus*, but smaller in size (see measurements below) and relatively more slender. Head more nearly perfectly oblong, with parallel, nearly straight sides, also more strongly depressed (index of cephalic depression 44±2). Eyes smaller, with only 5-8 facets evident in each. Dorsal surface of head extremely feebly convex dorsally, plane ventrally. In full-face view, posterior occipital border extremely feebly concave in the middle. Dorsum and sides of head with close but superficial "Scotch grain" coriaceous sculpture and a few sparse, widely spaced small piligerous punctures; the latter most numerous on the sides of the head, but even here not approaching in number or size the foveolae of the preceding species. Alitrunk with fine coriaceous sculpture much like that of head, but here punctulae are scarce and indistinct or altogether absent. Surfaces of head and alitrunk distinctly shining. Gaster smooth and shining.

Hairs a little less abundant and shorter than those of *foveolatus*, particularly on cephalic dorsum. Color as in *foveolatus*, but lighter, the gaster not so distinctly darkened in the middle. Other characters, except for certain slight proportional differences shown in the figure, as in *foveolatus*.

Holotype (U. S. National Museum) taken from the soil of a peach orchard in El Paso County, Texas, Nov. 2, 1936 (W. F. Turner, No. T-1872).

Paratypes, all females: Two specimens with the data as for holotype were very similar to it, but were lighter and more yellowish in color, lacking the gastric infuscation. The total length in the El Paso County (type locality) series ranged for three specimens from 1.63 to 1.70 mm.[1] Head length 0.35-0.42; alitrunk length 0.45-0.56 mm.; cephalic index 66-69.

One of the two El Paso County paratypes was dissected, and the maxillary palpi proved to be composed each of one cigar-shaped segment with slender, curved base; the single segment bears a low welt on the lateral face near midlength. The labial palpi are two-segmented, the apical segment robust, ovoid, fitting snugly into the curved, trumpet-shaped basal segment. The palpal segmentation in combination with the mandibular dentition may prove of value at some future date in differentiating the American forms from those of the Old World in which the labial palpi are stated to have one segment.

One female (figure 2) from Santa Rosa, Tabasco, Mexico, in a Berlese funnel soil sample with ants and collembolans, Aug. 16, 1945 (F. Bonet). Total length 1.79 mm., head length 0.39 mm., alitrunk length 0.60 mm., cephalic index 71. This specimen is much like the holotype, but is pale yellow in color. The two basal teeth of the mandibular series are much reduced, smaller than as shown in figure 3.

Three specimens from Urbana, Illinois, Feb. 18, 1945 (J. L. C. Rapp) taken in soil. Like the holotype but head a bit more convex dorsally and ventrally and also at the sides, in this respect tending toward *foveolatus*. Size, color and particularly the very similar sculpture ally this sample with *lucidus* and not *foveolatus*. Cephalic index 75-78.

One specimen, Duke Forest, Durham, North Carolina, June 2, 1945, "oak on sand, 2 inches deep," (A. S. Pearse). Total length 1.99 mm., head length 0.43 mm., alitrunk length 0.62 mm., cephalic index 73. Head shape intermediate between those of Texan and Illinoian specimens.

[1] Conditions of measurement and range of error as in corresponding measurements for *Ps. foveolatus* n. sp.

Mandible shown in figure 3. Punctulation of head a trifle coarser than in holotype, but not closely approaching that of the *foveolatus* types; specimen rather dirty, of dullish coloration.

The paratype series has been returned to the collection of the U. S. National Museum. *Ps. lucidus* as presently conceived may be separated from the related *foveolatus* by the striking sculptural difference as well as by the probably less reliable characters of size, head shape, color, etc. Discovery of *Psilobethylus* males in association with females on this continent will probably lead to revision of the status of the forms here included in *lucidus*.

We wish to offer our thanks to Mr. Muesebeck and Dr. Bonet for their aid in sending material and in furnishing other information used in this paper.

SOME NOTES ON SYNONOMY OF THE MYCETOPHILIDAE (DIPTERA). — In 1940 (Revista Ent., 11 :803-808), the author described several new species of Mycetophilidae from Costa Rica. Among these was included *Neoempheria neivai*. This publication appeared in December. Without the knowledge of the author, Dr. F. W. Edwards of the British Museum described some species of *Neoempheria*, including a *Neoempheria neivai* (Nov. Zool., 42:107-129). This paper appeared in April, 1940, and hence Edward's specific name *neivai* has priority. At this time I would like to rename my *Neoempheria neivai* and will substitute the name *phillipsi* for *neivai*. This name is selected in honor of Dr. E. F. Phillips whose untimely death during the past summer is greatly mourned.

During the current year, 1951, the author published descriptions (Bull. Brooklyn Ent. Soc., 46:65-70) of new Mycetophilidae from western United States. In these was included a new species which I named *Exechia ligulata*. Laffoon, in correspondence, has recently indicated that the name *ligulata* was a homonym having been used by Lundstrom in 1913. Hence I will substitute the specific name *subligulata* for my *ligulata*. F. R. SHAW, University of Massachusetts.

TWO NEW SPECIES OF DICTYNIDAE (ARANEAE) FROM PANAMA

By Arthur M. Chickering
Albion College, Michigan

As previously pointed out (Chickering, '50), Petrunkevitch ('25) was the first to report a dictynid (*Mallos niveus* O. P.—Cambridge) from Panama. Gertsch ('46) reported a male of *Dictyna meditata* Gertsch from the Canal Zone Biological Area. This species is now known to be fairly common over much of that region of Panama where I have worked. *Thallumetus dulcineus* Gertsch was described in 1946 from a single male collected at El Volcan in February. In 1950 I described three species of dictynids as follows: *Dictyna alyceae, D. donaldi,* and *Thallumetus pusillus*. The first two were from Boquete, and the third was from the Canal Zone Biological Area. From my collection of 1950 I have selected two new species belonging to this family. These are described in the present paper in accord with my usual formula and under the following names: *Dictyna lecta* sp. nov., and *Thallumetus pullus* sp. nov.

It is expected that the general state of our available knowledge on the Dictynidae of Panama and other parts of Central America will be made clear when a revision of the family is published by Dr. W. J. Gertsch, American Museum of Natural History, who is now engaged in this important study.

This paper is the first of a series of publications dealing with the spider fauna of Panama depending in part or wholly upon collections made during my period of field work in various parts of this interesting country during the summer of 1950. This most recent of a series of visits to Panama was made possible through grants from the Penrose Fund of the American Philosophical Society and The Society of Sigma Xi. The descriptions were drawn up during the summer of 1951 while I enjoyed the many advantages of the Museum of Comparative Zoology at Harvard College.

Genus *Dictyna* Sundevall, 1833

Dictyna lecta sp. nov.

(Figure 1)

Male holotype.—Total length 1.41 mm. (Abdomen and cephalothorax detached; otherwise in good condition). Carapace .704 mm. long; .55 mm. wide opposite second coxae where it is widest; pars cephalica very prominent and quite convex; almost circular from opposite palps; .352 mm. tall and, therefore, about .64 as tall as wide.

Eyes.—Eight in two rows: only AME diurnal. Viewed from above, posterior row moderately recurved. Viewed from in front, anterior row moderately procurved. Central ocular quadrangle wider behind than in front in ratio of 5 : 4; wider behind than long in ratio of 5 : 4; posterior row fully as wide as pars cephalica at that level; posterior row wider than anterior row in ratio of 28 : 25. Ratio of eyes AME : ALE :: PME : PLE=3.5 : 5 :: 4.5 : 5 (long diameters). AME separated from one another by a little more than 1.5 times their diameter, from ALE by their diameter. PME separated from one another by a little more than 1.5 times their diameter, from PLE by slightly less than 1.25 times their diameter. Laterals separated from one another by .3 of their diameter. Clypeus grooved below AME and ventral half strongly protrusive, the latter part provided with several stiff convergent bristles. Height of clypeus equal to about three times the diameter of AME.

Chelicerae.—Essentially vertical and parallel if taken as wholes; considerably bowed outward just above the middle of the outer border; excavated medially so as to form a long narrow oval opening between the two; with a prominent basal boss having a keel which extends for some distance; moderately concave in front; basal segment .40 mm. long; fang appears to be weak; impossible to determine exact number and position of teeth along fang groove without serious injury to type.

Maxillae.—Convergent; extend beyond lip about three tenths of their length; palp inserted into basal third.

Lip.—About as wide as long. Sternal suture straight.

Sternum.—Cordiform; moderately convex; only slightly longer than wide; widest between second coxae but nearly as wide between first coxae; with a moderately well developed coat of long light colored bristles; posterior end a blunt point between fourth coxae which are separated by nearly 1.5 times their width. All coxae of moderate length, but first are somewhat the most robust.

Legs.—1243. Width of first patella at "knee" .0758 mm., tibial index of first leg 10. Width of fourth patella at "knee" .05956 mm., tibial index of fourth leg 11.

(All measurements in millimeters)

	Femora	Patellae	Tibiae	Metatarsi	Tarsi	Totals
1.	.649	.162	.574	.412	.325	2.122
2.	.541	.162	.412	.304	.271	1.690
3.	.435	.108	.282	.293	.216	1.334
4.	.520	.140	.379	.401	.216	1.656
Palp	.335	.108	.119	——	.444	1.006

Each metatarsus bears a single long dorsal trichobothrium near the distal end of the segment; each tibia bears a long dorsal trichobothrium near the middle of the segment; other less conspicuous trichobothria may be present but this is uncertain. The calamistrum is well developed on the fourth metatarsus where it extends over the proximal four fifths of the segment.

Spines.—True spines seem to be completely lacking but bristles and spiniform hairs are numerous.

Palp.—The retrolateral tibial apophysis is very long and it projects at a right angle. The tarsus is much flattened and bent sharply toward the ventral side in its distal third; there is a long narrow cleft at its base and the basal hook is quite characteristically shaped. The cymbium is narrow and it projects beyond the embolus only a short distance; the embolus nearly encircles the structure (Fig. 1).

Abdomen.—Ovoid; .946 mm. long; longer than wide in ratio of 43 : 30; widest near the middle; the cribellum is undivided and quite normal in appearance; the six spinnerets are as usual in the genus.

Color in alcohol.—Carapace gray-brown with black streaks, lighter on top of the pars cephalica. Sternum and lip much the same but somewhat darker. Chelicerae and maxillae somewhat lighter. Legs and palps yellowish white. Abdomen: with a median dorsal yellowish stripe with irregular borders extending from near the base to the tip of the anal tubercle and enclosing two small central dark spots in its posterior half; dark brown elsewhere, obscurely spotted with yellowish.

Type locality.—Male holotype from El Volcan, R. P., August, 1950. No paratypes; female unknown.

Genus *Thallumetus* Simon, 1892

Thallumetus pullus sp. nov.

(Figures 2-5)

Male holotype.—Total length 1.755 mm. Carapace .704 mm. long; .682 mm. wide opposite second coxae where it is widest; .396 mm. tall and, therefore, about .58 as tall as wide; with steep and somewhat irregular descent almost immediately behind PME to bottom of posterior declivity opposite third coxae; no longitudinal thoracic groove observed; near bottom of steep posterior declivity there is a group of four or five moderately long stiff black bristles; pars cephalica quite convex and well separated from pars thoracica; with little or no hair but bristles are numerous around eyes and especially between both pairs of median eyes and below AME.

Eyes.—Eight in two rows, only AME dark. Viewed from above, both rows of eyes recurved. Viewed from in front, anterior row moderately procurved. Central ocular quadrangle only slightly wider behind than in front, wider behind than long in ratio of about 13 : 11. Ratio of eyes AME : ALE :: PME : PLE=4.5 : 4.5 :: 4 : 3.75 (ratios are difficult to establish with accuracy). AME separated from one another by slightly more than their diameter, from

ALE by their radius. PME separated by 1.5 of their diameter, from PLE by their diameter. Laterals barely separated. Clypeus markedly concave; height equal to about five diameters of AME. As already noted, the clypeus is provided with a cluster of bristles merging with those between AME.

Chelicerae.—Vertical, essentially parallel; with very slight bowing outward near base of outer margin; moderately excavated medially near middle to form a small oval opening between the two; with a moderately well developed basal boss; basal segment .35 mm. long; moderately robust; promargin of fang groove with three moderately stout teeth, retromargin with a single smaller one near distal end of groove (taken from paratype to avoid injury to holotype).

Maxillae.—Convergent; palp inserted into basal fourth; bluntly rounded at distal end.

Lip.—Wider than long in ratio of about 5 : 4; well rounded but not strongly narrowed at distal end; sternal suture very slightly procurved; maxillae extend beyond lip about two thirds of its length.

Sternum.—Somewhat scutiform; moderately convex; only slightly longer than wide; widest between second coxae but nearly as wide between first coxae; with a moderately well developed covering of long dark bristles; posterior end a bluntly rounded point extended between fourth coxae which are separated by slightly more than their diameter. All coxae of moderate length and nearly equal in width.

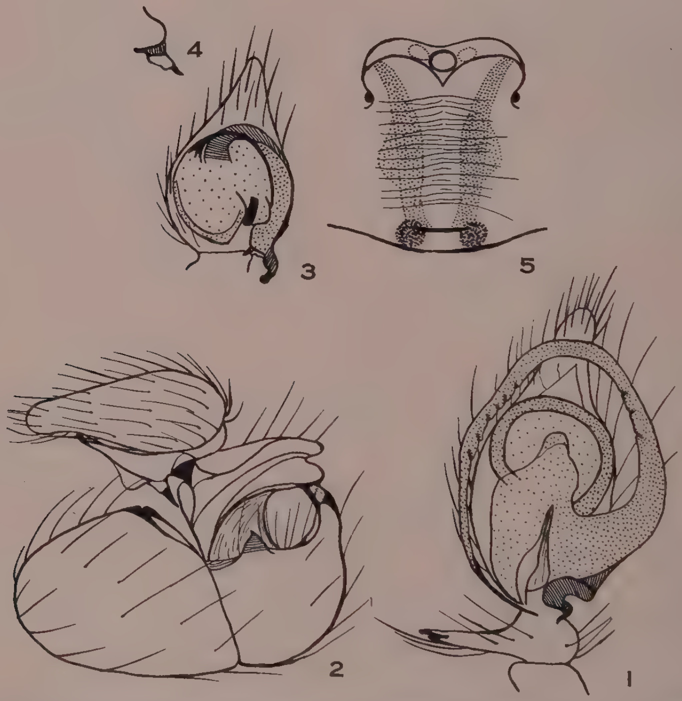
Legs.—1243. Width of first patella at "knee" .088 mm., tibial index of first leg 9. Width of fourth patella at "knee" .077 mm., tibial index of fourth leg 12.

(All measurements in millimeters)

	Femora	Patellae	Tibiae	Metatarsi	Tarsi	Totals
1.	.770	.220	.744	.528	.355	2.617
2.	.660	.220	.616	.484	.330	2.310
3.	.610	.176	.374	.440	.330	1.930
4.	.650	.176	.440	.484	.308	2.058
Palp.	.335	*.335	*.330	——	.330	1.350

* Including their processes.

The only trichobothrium so far seen with reasonable certainty is dorsal in position near the distal end of each metatarsus. The hairs of the calamistrum appear to be reduced in length but extend nearly the whole length of the fourth metatarsus.



Figures 1-5. External Anatomy of Dictynid Spiders. Fig. 1. *Dictyna lecta* sp. nov.; male palpal tibia and tarsus. Fig. 2. *Thallumetus pullus* sp. nov.; male palpal femur, patella, tibia, and tarsus; nearly retrolateral view. Fig. 3. *T. pullus;* palpal tarsus; ventral view. Fig. 4. *T. pullus;* palpal basal tarsal apophysis. Fig. 5. *T. pullus;* epigynum.

Spines.—True spines are lacking but spiniform hairs are numerous. Claws appear to be the same as described in *T. pusillus* Chickering ('50).

Palp.—Short, highly modified in all four segments from femur to tarsus, inclusive. Femur deepened so that it is only longer than deep in ratio of 34 : 25; somewhat flattened laterally but very robust; its distal ventral rim is strongly chitinized. The patella is very robust and is drawn out distally to form a large strong chitinized ramus ending in a strong tooth; near its base there is a short robust retrolateral pointed tubercle. The tibia is also strongly modified; it is curved to meet the patellar ramus and together with this segment forms a kind of forceps; the tibial ramus terminates in three points between which the tip of the patellar ramus terminates; this segment also has a robust, strongly chitinized, retrolateral pointed tubercle near its base. The meeting place of the patella and tibia leaves a relatively large rounded aperture between them thus suggesting an important specific use. The most characteristic tarsal feature appears to be the conspicuous basal apophysis of special shape (Figs. 2-4).

Abdomen.—Broad at base, widest about two fifths from base, narrows to a point at anal tubercle, overlaps carapace somewhat; with a series of three transverse dorsal grooves in posterior fifth; with four quite clear dorsal sigilla in second fourth, the first pair especially distinct; cribellum of normal size, clearly undivided, with numerous stiff bristles along its anterior surface; six spinnerets as usual in the genus.

Color in alcohol.—Carapace light reddish brown with dark streaks. Sternum and mouth parts various shades of amber. Legs: nearly uniformly dark brown, lighter below. Abdomen: generally dark brown, nearly black above, lighter below; on the dorsum just anterior to middle there is a small irregular light spot which is more conspicuous on some of the paratypes.

Female allotype.—Total length 1.716 mm. Carapace .660 mm. long; .638 mm. wide; .264 mm. tall and, therefore, about .41 as tall as wide. Pars cephalica much less prominent than in male. The characters of the female with respect to eyes, chelicerae, maxillae, lip, and sternum are so closely similar to those of the male that a detailed description of these parts is regarded as unnecessary.

Legs.—1423. Width of first patella at "knee" .08664 mm., tibial index of first leg 11. Width of fourth patella at "knee" .08123 mm., tibial index of fourth leg 11.

	Femora	Patellae	Tibiae	Metatarsi	Tarsi	Totals
		(All measurements in millimeters)				
1.	.748	.242	.572	.484	.355	2.401
2.	.660	.231	.484	.418	.352	2.145
3.	.572	.198	.418	.396	.308	1.892
4.	.616	.220	.528	.484	.308	2.156

The calamistrum is well developed, consisting of a row of curved hairs on the proximal four fifths of the fourth metatarsus.

Abdomen.—Essentially as in male. Cribellum well developed, normal to the genus.

Epigynum.—Relatively large; convex; with a short transverse lip near the genital groove; a small spermatheca lies at each end of the lip; two diverging stripes extend forward from the lip; lateral to the anterior end of each stripe there is a small depression (probably an opening); the anterior end of the epigynal plate is formed by a strongly chitinized curved band with a central opening. Dissection reveals the presence of several tubules, nodules, etc. just internal to the surface. The convex part of the plate is finely and transversely rugulose (Fig. 5).

Color in alcohol.—Almost identical with that of male except that the light areas on the dorsum are plainer; here in the female they are two light brownish spots separated by a central dark stripe; in some paratype females the light spots are large and quite conspicuous.

Type locality.—Male holotype from Canal Zone Biological Area, C. Z., July, 1950; female allotype from the same locality, August, 1950. Several paratypes of both sexes from the same locality, July-August, 1950.

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CARNUS HEMAPTERUS NITZSCH ON A SCREECH OWL IN ARIZONA (DIPTERA). — In 1942 I recorded this ectoparasite from a flicker in New York State and from a screech owl in Florida, and reviewed what was known of its distribution and natural history (Bull. Brooklyn Ent. Soc., 37: 140-149). I was informed since that it was found in British Columbia and California, the details of these occurrences to be published later by the discoverers. Meanwhile I may record that it occurs also in Arizona. A collection of bird-flies, recently received from Professor George D. Butler, Jr., of the University of Arizona, contains 5 deälated specimens (3 males and 2 females) taken April 24, 1938, by Mr. S. L. Jacot on a nestling Arizona screech owl, *Otus asio gilmani* Swarth, 9 miles east of Tucson, at 2300 ft. altitude. No doubt the insect is widely distributed in North America, but overlooked owing to its small size (1.5 to 3 mm.). — J. BEQUAERT, Museum of Comparative Zoology, Cambridge, Mass.

THE EUROPEAN MANTIS, MANTIS RELIGIOSA (LINNE), IN CONNECTICUT. — At the time Dr. Nutting published his survey on the distribution of the European mantis in New England, (Psyche, 57:28, 1950) only one specimen was recorded from Connecticut. This single specimen was listed as possibly from Connecticut, without data.

During the summer of 1951 the author collected four males and eight females of this species at Storrs, Connecticut. The first was a full grown nymph collected in meadow grass on August 12. It transformed into an adult female a few days later. The following adults also were collected:

On Aug. 13, two males and a female; Aug. 19, one female; Aug. 29, one female; Aug. 21, one male and one female; Sept. 12, one female; Sept. 14, one male; Sept. 15, one female; Sept. 16, one female. Most of the specimens were taken in fairly tall grass in a meadow, but one female was taken on a huckleberry bush at the edge of a wooded area and one male on the campus at the University of Connecticut. Mr. Franklin B. Lewis also collected a male specimen on the campus. The males fly readily and probably their dispersal is greater locally than that of the females.

Two egg masses were found in the field on Sept. 13. They were deposited on grass six or eight inches above the ground. Several egg masses were obtained from caged mantids.

One of the captive males was eaten by the female after copulation. The preferred food of these mantids in captivity appears to be small long-horned grasshoppers (Conocephalinae), although they will feed on various species of grasshoppers. They have been observed to eat specimens as large as *Neoconocephalus* (Copiphorinae) and false katydids (Phaneropterinae). They consistently refused to accept specimens of the Pentatomidae, order Hemiptera.— R. M. DECOURSEY, University of Connecticut, Storrs, Conn.

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